Ground Water Protection in Virginia

2005 Annual Report of the Ground Water Protection Steering Committee

Virginia Department of Housing and Community Development

www.dhcd.virginia.gov

The Virginia Department of Housing and Community Development (DHCD) provides significant financial assistance to water and sewer-related projects across the Commonwealth. A description of the major programs for water and sewer related projects and their funding sources follows:

Virginia Community Development Block Grant
DHCD has administered the Virginia Community Development Block Grant (CDBG) Program since 1982. DHCD uses federal funds available from the U.S. Department of Housing and Urban Development (HUD). DHCD funds projects in eligible non-entitlement localities. These local governments do not receive CDBG funding directly from HUD. Each CDBG-funded project must meet one of the following three national objectives:

Activities benefiting low- and moderate-income persons;

Activities preventing or eliminating slums or blight; and

Activities designed to meet urgent community needs.

CDBG includes several funding categories under the broad heading of Community Improvement Grants (CIG). In 2005, the agency reserved $1 million for construction-ready water and sewer projects. This funding is available only in areas where at least 65 percent of the households have low- or moderate- incomes.

The Department reserved approximately $3 million in CIG funds for Community Economic Development projects.

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DEQ's Hazardous Waste Permitting Program Wins Second National RCRA Award

DEQ continues to show its commitment to cleaning up the environment, finding new ways to conduct the site-wide corrective action program known as RCRA Corrective Action, and encouraging brownfield redevelopment at hazardous waste sites. As a result staff members in the Hazardous Waste Permitting program have been recognized by EPA for the second year on a national level for its efforts and leadership in the RCRA CA program.

In 2004, the Hazardous Waste Permitting staff received the State Streamlining Corrective Action Award recognizing their leadership in implementing a results-based program that focused on environmental cleanup over process as well as setting the standard for State and Federal partnerships.

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The U.S. Geological Survey

The United States Geological Survey (USGS) continued the cooperatively funded assessments on the availability of ground water in the northern Shenandoah Valley carbonate and siliciclastic aquifer systems with Frederick, Warren, and Clarke counties, and the North Fork Shenandoah River Minimum Instream Flow (MIF) investigation with the Northern Shenandoah Valley Regional Commission (figure 1). The first report from the Frederick County carbonate aquifer investigation will be provided to Frederick County and the final report of the North Fork Shenandoah MIF investigation will be provided to the Northern Shenandoah Valley Regional Commission and local stake holders in 2005. Results of the Frederick County investigation include estimates of effective ground-water recharge and water budgets for both the Cedar and Opequon Creek basins for 2001-02, at the end of an extended drought period. Data collected during the study thus far can be accessed at http://va.water.usgs.gov/va134/index.htm. Results of the MIF study, conducted by the USGS and Virginia Tech, will serve as the technical foundation for consensus decision making by local communities to manage water withdrawals from the North Fork during critical low flow periods.

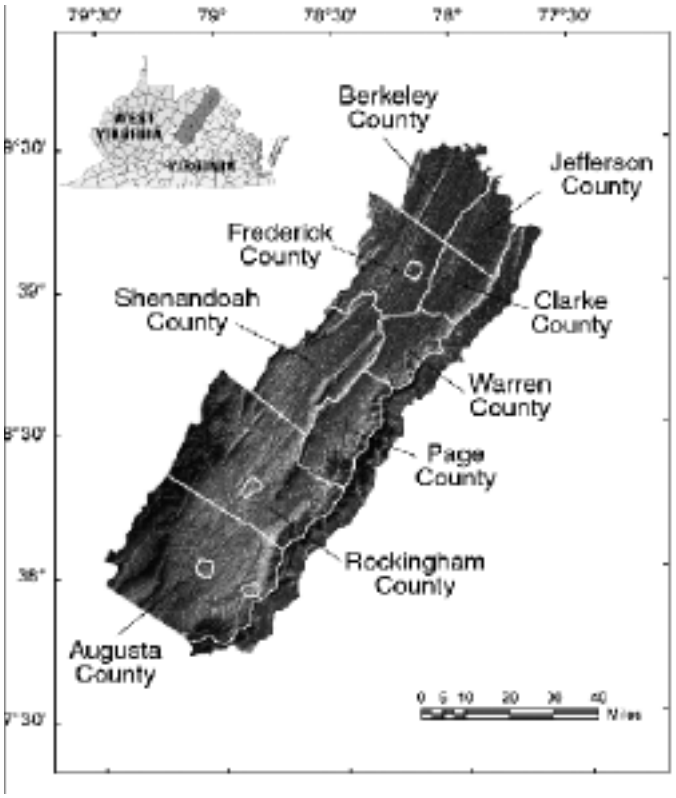

Figure 1. *Map of the Shenandoah Valley Region of Virginia and West Virginia.*

In 2004, the USGS began constructing ground-water-flow models, in the Shenandoah Valley, at both local and regional scales to better define the availability of ground water and its response to current and future development. These models are being constructed to use environmental tracer data that define age distributions of water in discharge from karst springs; hydrologic data derived from research seismic imaging techniques in karst areas, and updated geologic information. A Regional Shenandoah Valley model grid was developed and files are being prepared to display model data. Files are under preparation to display base flows, water levels and spring discharge points required for model development. A groundwater simulation model is also being developed for the Opequon Creek watershed, in the northern tip of Virginia. Water-resources and land-use managers in the Opequon basin need better hydrologic information to make decisions about source-water protection and land development. In order to assess current and future hydrologic conditions within the basin, the USGS is collecting stream and ground-water data and using them to build a numerical model that simulates basin hydrology. The primary objective of the flow model is to assess the current availability of ground-water within the region. Secondary objectives include assessing the impact of drought and future population growth, and developing a better understanding of the impacts of ground-water withdrawals on in-stream flows. The development of a ground-water flow model will provide insight into the nature of the basin's complex hydrology and allow drought conditions and the effects of population growth to be evaluated. The simulation model will be used by multiple parties for planning and operational purposes.

A number of karst springs were located and sampled for environmental tracers to develop methods to determine fractions of

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Department of Conservation and Recreation Karst Program

The karst program continues to provide a high level of technical support to citizens, local governments, and partner agencies. Through the state environmental review office in the Department of Conservation and Recreation (DCR) Division of Natural Heritage, the karst program has provided comments on numerous projects, some of which have significant potential to adversely impact karst groundwater resources. Some of the past and current activities include:

- Coordinating with American Electric Power to monitor an important karst spring for potential impacts from the construction of a 765kV electrical power transmission line.
- Working with consultants and local citizens to investigate the potential environmental impacts of a proposed water supply withdrawal from a karst spring in Frederick County.
- Addressing issues with citizens of the Town of Pulaski who expressed concerns over the disposal of storm water from a proposed development site into a sinkhole.
- Assisting Columbia Gas Transmission Company and local citizens address public safety and water quality concerns associated with the installation of a regional gas transmission line in Shenandoah and Rockingham counties.
- Assisting the County of Warren and the Lord Fairfax Soil and Water Conservation district to address water quality issues in the Willow Brook and Crooked Run watersheds, both of which are significantly derived from karst lands overlain by a rapidly developing industrial and commercial area.
- Working with the Nature Conservancy and the Virginia Outdoors Foundation to document karst resources on proposed easement properties and ensuring that karst protection measures are incorporated into the conservation easements.
- Assisting the Virginia Department of Forestry and Virginia Cooperative Extension in addressing impacts to karst waters from timber harvesting operations and educating loggers on ways to minimize such impact.

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Chesapeake Bay Preservation Duties Go To Conservation Department

Effective July 1, 2004, the Virginia Department of Conservation and Recreation was responsible for implementing the Chesapeake Bay Preservation Act as the former Chesapeake Bay Local Assistance Department became a part of the conservation agency.

The merger between CBLAD and DCR is the result of legislative budget action taken during the special session that ended in May and was confirmed at the June 16 reconvened session. CBLAD became an operational division of DCR, joining other program areas, such as state parks, soil and water conservation, natural heritage, planning and recreational resources, and dam safety and floodplain management.

Implementation of the Chesapeake Bay Preservation Act complements DCR's role as the state's lead nonpoint source pollution prevention agency. DCR was also given new responsibilities in stormwater management as the result of separate legislation initiated by Governor Warner and passed unanimously by the 2004 General Assembly.

"Staff from both agencies are committed to making this consolidation work as effectively and efficiently as possible," says DCR Director Joseph H. Maroon. "My goal will be to see that the water quality benefits derived from the Chesapeake Bay Preservation Act continue and that we strengthen dialogue with the affected localities, building industry and conservation community."

CBLAD and DCR staffs have developed plans to integrate numerous functions. Those localities under the preservation act should initially see minimal changes in the technical services and oversight provided by the state.

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Educational Outreach for Resource Protection

There were five ground water festivals held in calendar year 2004. The Dickenson County and Buchanan County festivals, held at Breaks Interstate Park, were organized by Mr. Toby Edwards,Cumberland Plateau Regional Waste Management Authority. Two festivals held for the Lancaster County and Northumberland County sixth graders were organized by Mrs. Audrey Brainard and Mrs. Kathy Moeller, Northumberland Association for Progressive Stewardship. These events were held at Camp Kittamaqund. Mrs. Mary Ann Massie teamed up with Mrs. Carol Zokaites with the Department of Conservation and Recreation and Mrs. Cynthia Hancock with the Skyline Soil and Water Conservation District to host a festival for the Floyd County sixth graders at the Selu Conservancy. More than 800 students participated in ground water protection educational stations. Five festivals are being held in 2005. For more information contact Mary Ann Massie at 804-698-4042.

Funding for the Virginia Ground Water Protection Steering Committee activities, including development of this Report, is provided through a grant to the Department of Environmental Quality by the U.S. Environmental Protection Agency.

The Ground Water Protection Steering Committee meeting is held on the third Tuesday of the odd numbered months (January, March, May, July, September, and November)

Meetings are generally held at the Department of Environmental Quality, 629 East Main Street, Richmond from 9 a.m. to 11 a.m. Meetings are open to the public.

For more information contact Mary Ann Massie at DEQ 8040-698-4042 or email mamassie@deq.virginia.gov or visit www.deq.virginia.gov/gwpsc

Meeting summaries and announcements are posted on the Regulatory Townhall at www.townhall.virginia.gov

The Ground Water Protection Steering Committee is an inter-agency advisory committee formed to stimulate, strengthen and coordinate ground water protection activities in the Commonwealth. The Annual Reports allow us to highlight our progress; to educate Virginia citizens, businesses, and officials about the importance of ground water; and to publicize state programs that can assist those relying on ground water to ensure its continued quality and availability.

Particular emphasis is made at the meetings on education and information exchange. Meetings are open to the public. In 2004 our members and guests heard presentations on the 2004 Ground Water Festivals, DEQ's Water Supply Technical Advisory Committee, VDH's Biosolids Program and Regulations, DCR's Nutrient Management Program, and biosolid's research by Dr. Greg Evanylo with Virginia Tech. We enjoyed a guided tour of the Division of Consolidated Laboratory Services facility as well.

For more information on the Steering Committee visit www.deq.virginia.gov/gwpsc or call Mary Ann Massie at 804-698-4042.

The following agencies have representation on the Ground Water Protection Steering Committee:

Virginia Department of Environmental Quality (chair)

Virginia Department of Health

Virginia Cooperative Extension

Virginia Department of Business Assistance

Virginia Department of Conservation and Recreation

Virginia Department of Mines, Minerals, and Energy

Virginia Department of Agriculture and Consumer Services

Virginia Department of Housing and Community Development

Virginia Department of General Services/Division of Consolidated Laboratory Services

US Geologic Survey

Visit www.deq.virginia.gov/gwpsc for member links.

DEQ's Hazardous Waste Permitting Program Wins Second National RCRA Award

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In early 2005, a team of three DEQ staff members (Maria Williams, Dennis Lund and Kelly Ward) were awarded the State Corrective Action Reform Award. This award recognized the team's innovative approach in encouraging clean up and redevelopment at brownfield sites subject to RCRA Corrective Action. With EPA's support and participation, the team met with a selected group of industries in the Tidewater area of Virginia and offered a collaborative approach to meeting the RCRA program goals. At the meetings, the team was able to explain the program requirements, provide a flexible regulatory mechanism, and discuss a source of low interest loans. The Brownfield Remediation Loans are available through the Construction Assistance Program funded through the Clean Water Act and are used to remediate or protect surface or groundwater in the Commonwealth. For more information on this program contact Maria Williams at 804-698-4211 or email mswilliams@deq.virginia.gov

AGRICULTURAL STEWARDSHIP ACT PROGRAM

April 1, 2004 through February 28, 2005

Background and Overview

The Agricultural Stewardship Act is the result of a joint effort by Virginia's agricultural and environmental communities, the Association of Soil and Water Conservation Districts, and state agencies to develop a common-sense solution to water pollution problems caused by agricultural operations. The Commissioner of the Virginia Department of Agriculture and Consumer Services is responsible for the administration and enforcement of the ASA. The goal of the Act is to consider the needs of the farmer while meeting the requirements of the environment.

Summary of Complaints

During April 1, 2004 through February 28, 2005, the Commissioner received 31 official complaints regarding possible agricultural pollution. These official complaints fell into 7 different categories according to commodity produced or raised: beef – 6 (19.4%); beef/hog – 1 (3.2%); cropland – 12 (38.6%); dairy – 2 (6.5%); hog – 3 (9.7%); horse – 6 (19.4%); and horse/cattle – 1 (3.2%).

The Agricultural Stewardship Act addresses water pollution problems caused by nutrients, sediments and toxins entering state waters from agricultural activities. Eleven complaints received in the reporting period indicated that both sediments and nutrients were involved. Five complaints were attributed to pollution problems involving nutrients only, while 15 faulted only sediments as contributing to pollution problems.

The Commissioner's Office, together with local SWCD's in many cases, completed investigations for 27 of the 31 official complaints received. As of February 28, 2004, four complaints were awaiting a decision by the Commissioner. Of the 27 complaints on which the Commissioner acted before the end of the eleven-month period, Department investigations determined that 18 of the complaints revealed insufficient or no evidence of water pollution, therefore, these complaints were unfounded. In one case, the complaint was dismissed because the complaint related to matters outside of the purview of the ASA. In 8 of the investigations, there was sufficient evidence to support the allegations that the agricultural activities were causing or would cause water pollution. These cases were determined to be founded.

Plan Development, Review and Maintenance

The Department's efforts to investigate complaints are just the beginning when a complaint is determined to be founded. The agency is also charged with working with farmers and local soil and water conservation districts on the development of plans to address identified pollution problems. The Department is responsible for conducting six-month and 18-month field reviews to make sure that plans are on schedule as far as implementation and that implemented plans are maintained to prevent the re-occurrence of pollution problems identified by the Department in its response to complaints received under the ASA.

At the recommendation of staff, the Commissioner conducted informal fact-finding conferences to determine whether two agricultural operations were maintaining their ASA stewardship plans and whether the plan for one operation was completed in compliance with the Act. The Commissioner issued corrective orders finding that two agricultural operations were out of compliance and establishing deadlines in which compliance must be achieved. A third corrective order was being prepared for issuance as of February 28, 2005.

For more information on the ASA Program visit http://www.vdacs.virginia.gov/stewardship/index.html or call Glenn Martin at 804-786-2658.

2004 PESTICIDE DISPOSAL PROGRAM

The Virginia Department of Agriculture and Consumer Services (VDACS), in cooperation with the Virginia Pesticide Control Board (PCB) and Virginia Cooperative Extension (VCE) completed the 2004 Pesticide Disposal Program in early December. Two hundred and three agricultural producers, pesticide dealers and pest control firms disposed of 210,423 pounds of unwanted, outdated and banned pesticides during this year's collection efforts at 33 localities.

In 2004, the program achieved a major milestone as it surpassed the millionth-pound mark. Since its inception in 1990, the program has collected 1,158,851 pounds of unused pesticides from 2,308 program participants. Virginia has joined thirteen other states in collecting a million pounds or more. The program, which is free for participants, is funded through pesticide fees collected by VDACS' Office of Pesticide Services.

The 2005 Pesticide Disposal Program will be conducted in the Northern Neck and Middle Neck area. For more information, contact Liza Fleeson, Compliance Manager, Office of Pesticide Services, at 804-371-6561.

Virginia Department of Housing and Community Development

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Eligible projects include off-site water, sewer, roads and drainage. DHCD also designated approximately $10 million for the Competitive Grants category for 2005. Eligible activities include Community Facility funding for water, wastewater and drainage improvements and Comprehensive Community Development projects that target multiple activities including water and sewer rehabilitation.

For more information on the block grant program contact DHCD staff member Denise Ambrose at 804-371-7029.

Self-Help

Self-Help Virginia helps small communities create viable and affordable water and wastewater systems. This program operates under the Community Development Innovation funding heading. It uses an outcome-oriented approach that emphasizes problem-solving and dollar-savings. Self-Help projects tap neighborhood talents, manpower and creativity to provide water and sewer services in areas where conventional approaches may be impractical or unaffordable. The program stretches limited financial resources to assist more communities than would be otherwise possible.

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Virginia Department of Agriculture and Consumer Services staff changes:

After many years of services at VDACS, Dr. Marvin Lawson, Director, Division of Consumer Protection, and Mr. Daniel Schweitzer, Compliance Manager, Office of Pesticide Services retired.

The new Director of Consumer Protection is Andres Alvarez, who previously served as program manager in our Office of Consumer Affairs for 6 years.

Dr. Wayne Surles is the new program manager for the Office of Pesticide Services, and Ms. Liza Fleeson is their new compliance manager. Ms. Fleeson also directs the pesticide disposal and container recycling programs.

Contact Information:

Andres Alvarez (804) 225-3821
Andres.Alvarez@vdacs.virginia.gov

Dr. Wayne Surles (804) 371-6559
Wayne.Surles@vdacs.virginia.gov

Ms. Liza Fleeson (804) 371-6561
Liza.Fleeson@vdacs.virginia.gov

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Examples of Self-Help Virginia activities include neighborhood residents acting as their own project managers, laying water and sewer lines, and operating leased or donated excavation equipment. Qualifying projects must:

Be limited to no more than $350,000 in CDBG assistance;

Be limited to water and sewer projects with no more than $10,000 in CDBG assistance per household served;

Use more volunteers from the community than paid workers;

Be supported by cost estimates demonstrating a minimum of 40% savings over conventionally-contracted projects;

Conduct, early in the process, at least one well-attended community meeting must occur supporting the project; and

Verify that at least 51% of the proposed beneficiaries are low-or moderate-income, and signed user agreements will need to be produced.

Most Self-Help funds are used for materials; however, necessary labor, engineering, and administrative costs are also eligible. (Administrative costs are limited to 10% of the grant). Approximately $1,000,000 in funding for the Self-Help Program has been provided for 2005.

For more information on Self-Help Virginia contact DHCD staff member Jimmy Wallace at 276-676-5471.

Appalachian Regional Commission

DHCD also provides water-related funding through its administration of the Virginia Appalachian Regional Commission (ARC) program. ARC was designed to foster economic development and to improve the quality of life for Appalachian citizens. The Program provides assistance in the longer-term development of a chronically depressed region encompassing 23 counties and seven independent cities. Special efforts assist designated distressed counties (Buchanan and Dickenson). ARC undertakes projects that address four goals identified by ARC in its strategic plan:

Increase job opportunities and per capita income;

Strengthen the capacity of the people of Appalachia to compete in the global economy ;

Strengthen the physical infrastructure; and

Build the Appalachian Development Highway System.

Virginia's ARC program provides up to $500,000 for construction projects and up to $100,000 for non-construction projects. Applicants provide a dollar-for-dollar match except in ARC-designated Distressed Counties. Distressed Counties only require a 20% match of the total ARC grant. In the past year, ARC provided approximately $3.5 million in funding for community and economic development projects through three programs: the Area Development Program, the Appalachian Entrepreneurship Program, and the Appalachian Telecommunications Program. The Area Development Program funded projects that include water and sewer service to communities and industries. Grassroots participation is encouraged. Applicants include localities, PDCs, educational institutions, health organizations, non-profit organizations and others.

For more information contact DHCD at 804-371-7000 or visit www.dhcd.virginia.gov

Indoor Plumbing Rehabilitation

DHCD also addresses water needs through the Indoor Plumbing Rehabilitation (IPR) Program. This program provides zero-interest, forgivable loans in eligible localities for the installation of indoor plumbing to owners of substandard housing where indoor plumbing does not exist, or where the existing water delivery or waste disposal systems have failed. The homeowner's ability to pay determines loan repayment provisions. The program also provides for the general rehabilitation of these units and for accessibility improvements in units occupied by persons with disabilities or where overcrowded conditions exist. DHCD contracts with locally appointed subrecipients (typically local governments, non-profit housing providers, and housing authorities) to administer the program. Subrecipients are responsible for most program operations including outreach, application intake, beneficiary and property eligibility determination, and construction management. The IPR program received approximately $5.7 million in federal program and state general funds for the 2004-2006 biennium.

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"Men are From Mars, Data is From VENIS"

VENIS has a different connotation at the Virginia Department of Health (VDH) these days. While men may be task-oriented and women may be relational-oriented, the data generated from VENIS will help us relate to each other and to our customers. VDH is very thankful to be using a statewide database to track services in their onsite sewage and water programs. We believe it is the first comprehensive data management system for a state environmental health agency.

VENIS is an acronym for Virginia Environmental Network Information System. The program, based in Lotus Notes, was implemented in 2001 on the Food Protection side of the environmental programs and has been operational for the Division of Onsite Sewage and Water Services since July 2003. VDH has responsibility to issue septic tank and private water well permits and receives about 40,000 applications every year. We are shifting focus to maintenance and monitoring of sewage systems and water wells and it is essential to know how many are installed and where they are located. In our current Information Age, we are striving to be more accountable in data management and the tracking of wells and sewage systems.

Each local health department enters data into the system and is able to retrieve and compare information from around the Commonwealth. A local manager now has easy access to the number of well permits issued, whether they were replacement wells or wells that have been decommissioned. This is a great tool for planning, workload management, water well issues during a drought, and for localities in evaluating growth trends.

For further information about VENIS or the private water well program at VDH, contact Duke Price, Program Manager, at (804) 864-7460 or duke.price@vdh.virginia.gov

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For more information contact DHCD at 804-371-7000 or visit www.dhcd.virginia.gov

Southeast Rural Community Assistance Project

DHCD also provides water-related funding through the Southeast Rural Community Assistance Project (Southeast RCAP). Virginia is a member of this project along with the states of Delaware, Maryland, North Carolina, South Carolina, Georgia and Florida.

Southeast RCAP helps small rural towns and communities upgrade their water and wastewater systems. Low-income individuals and communities are eligible for grants and loans that assist the rehabilitation of housing, the construction of water and wastewater infrastructure, in small business development, and the financing of development projects for small rural governments. Various Southeast RCAP programs use volunteers to conduct projects, train community leaders, and train and recruit additional local volunteers. For the 2004-2006 biennium, Virginia contributed just over $2.9 million to Southeast RCAP.

For more information on Southeast RCAP call 540-345-1184 or visit www.sercap.org

2004-2006 Biennial Budget

The 2005 General Assembly added $5 million in the amended budget for clean water projects in Southwest Virginia. The money is intended to pay the capital costs for safe drinking water and wastewater treatment in the Lenowisco, Cumberland Plateau, or Mount Rogers planning districts. DHCD must leverage the appropriation with other state moneys, federal grants or loans, local contributions, and private or nonprofit resources.

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young and old water in spring discharge, estimate the age of young fractions, identify cases of more complex subsurface mixing and estimate mean residence time of the ground-water reservoir. Geologic mapping was completed in the Winchester and Stephens City 1:24,000 scale quadrangles of Frederick County. Karst features collection was completed over an area that includes both Frederick and Clarke counties. Updated 10-meter digital elevation models were completed for Frederick County, and are 75% complete for Clarke County.

In 2005, wells will be selected to use as targets in model calibration and design boundary conditions used in the models. The model grid and layering will also be discussed to determine the appropriate structural features (faults) to represent in the model. Geologic mapping will be conducted in the Stephenson and Inwood quadrangles of Frederick and Clarke counties. At least one and possibly two field sites will be selected for the methods development and testing phase of the Karst Seismic Imaging Initiative. Some combination of high-resolution surface-wave seismic, high-frequency seismic reflection and 2-D electrical resistivity imaging surveys will be conducted over a grid such that the data can be examined in 3-D to delineate bedrock topography and karst features. USGS technical staff also will continue to meet semi-annually with state and local decision makers through the Great Valley Water-Resources Science Forum to share new information resulting from the study (http://va.water.usgs.gov/GreatValley/Index.htm).

A project to update and revise the Eastern Shore ground-water flow model continues during 2005 from its inception in 2003. The Eastern Shore of Virginia is a sole-source aquifer that has been designated by the Commonwealth of Virginia as a ground-water management area. This project is being conducted in cooperation with the Accomack-Northampton PDC, and the Virginia Department of Environmental Quality (DEQ). Ground-water quality samples were collected earlier to define the chloride distribution in the aquifer system. Carbon-14 ages from the ground-water samples are now being determined using the USGS geochemical model NETPATH, and will be applied to estimate ground-water recharge rates. A high resolution model has been constructed, featuring 37,740 model cells spaced at thousand-foot intervals, that enables accurate representation of important hydrogeologic features such as deeply buried paleo-channels formed by the ancestral Susquehanna River which potentially act as leaky conduits between the shallow and deep flow systems. Predevelopment model simulations have been performed to estimate regional ground-water parameters. Compilation of historical ground-water water levels and withdrawals has been completed, and simulations of the period of ground-water development to the present time will be performed to complete the model. The revised model will be used by local communities for long-term water supply planning and by the Virginia DEQ to support ground-water permitting decisions.

Region-wide characterization of ground water throughout the Virginia Coastal Plain also continues during 2005. Southeastern Virginia and the York-James Peninsula have been designated by the Commonwealth of Virginia as a ground-water management area, and ground-water withdrawals on the Middle Peninsula and Northern Neck also are increasing. A large scale study effort is being carried out in cooperation with DEQ and the Hampton Roads Planning District Commission (HRPDC). A central study topic is the Chesapeake Bay impact crater that was discovered by USGS and DEQ during the 1990's. Ground-water samples from two deep observation wells constructed during 2004 near the center of the crater at Cape Charles will be sampled during 2005 and undergo hydrochemical analyses to further understanding of the origin of salty ground water associated with the crater, including the geologic evolution of highly saline brine that likely developed from hydrothermal activity following the impact.

With recognition of implications of the crater for the ground-water resource, the Coastal Plain aquifer framework and ground-water flow model are being revised (see 2000-04 Annual Reports). Stratigraphic correlation of bore-hole geophysical logs has been completed that represents the configuration of Coastal Plain aquifers and confining units. The refined hydrogeologic framework will be published in 2006. Expanding beyond the effort for the Eastern Shore above, historical ground-water water levels and withdrawals also have been compiled for entire Virginia Coastal Plain as well as adjacent parts of Maryland and North

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Carolina. In addition to actual reported withdrawal amounts, an estimate of the amount and distribution of unreported self-supplied domestic withdrawals was derived from Census Block Group data and road density analyses along with a county-by-county analysis of the hydrogeologic framework. Domestic ground-water withdrawals comprise an estimated 30 percent of the total withdrawal, and will be detailed in a report to be published in late 2005. The aquifer-framework, water-level, and withdrawal information are being applied toward development of a new regional ground-water flow model of the entire Virginia Coastal Plain. The improved model features the ability to simulate variable-density flow near coastal areas, more accurate ground-water level computation, and a fine vertical resolution of the aquifer framework. Geologic time-frame simulations have been performed to improve understanding of the origin of saltwater in the impact crater. During 2005 the model is being calibrated using inverse methods to match observed historic ground-water levels, salinities, and carbon-14 age-dates. The calibrated model will be used by DEQ and HRPDC for long-term water supply planning and to support ground-water permitting decisions. Its public release will be made when documentation is published in 2007.

The USGS also is continuing assessment of the Virginia Beach shallow aquifer system. On-going changes in ground-water levels are being measured from a network of eight continuously monitored wells. In addition, a ground-water model developed during 2003 is being refined across the central transition zone separating urban land use in the north from the rural area to the south. The refined model is being used to simulate hypothetical effects on the ground-water system from activities such as golf-course irrigation, open-pit mining, and residential development. More details are available from a project web site at http://va.water.usgs.gov/projects/va113.html. In 2005, more continuous-record wells including several "real-time" water-level monitors will be added to the network. Also, a USGS Scientific Investigations Report on the results of the ground-water flow simulations will be published in the summer of 2005.

For more information on the Valley project contact George Harlow at 804-261-2631.

For more information on revisions to the Coastal Plain model contact Randy McFarland 804-261-2641.

For more information on the Virginia Beach Shallow Aquifer study contact Barry Smith at 804-261-2640.

Chesapeake Bay Preservation Duties Go To Conservation Department

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"I have full faith and confidence in Joe Maroon and Scott Crafton and their staff to make this work," said W. Tayloe Murphy, Jr., Virginia Secretary of Natural Resources. Murphy is the author of the 1988 preservation act that created the Bay department.

The Chesapeake Bay Preservation Act calls for the state to work with localities in Eastern Virginia to guide land use and install conservation practices that reduce nonpoint source pollution to surface and ground waters discharging to the Chesapeake Bay. The act calls for numerous local government regulations regarding land use aimed at benefiting water quality.

DCR has a broad statewide mission that includes technical assistance and funding to prevent runoff pollution from agricultural and developed lands. In addition to the Chesapeake Bay Preservation Act, the agency administers the state's Erosion and Sediment Control Act, the newly defined statewide stormwater management program, and the agricultural cost-share and state nutrient management programs. Implementation of these programs benefits waters of the Commonwealth, including ground water. For more information on programs at the Department of Conservation and Recreation visit www.dcr.virginia.gov

Virginia Karst Program - DCR Division of Natural Heritage

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Data development tasks, in 2004, have focused on biological inventories of cave-adapted crustaceans in at-risk watersheds. Staff has assisted the United States Fish and Wildlife Service in assessing the habitat and range of *Lirceus culveri*, an extremely rare cave-adapted crustacean, endemic to the Rye Cove area of Scott County. This area is undergoing rapid land conversion due to proximity to the Kingsport, Tennessee metropolitan area, and as a result, the Fish and Wildlife Service is considering *Lirceus culveri* for potential listing under the endangered species act. Such a listing would result in higher standards of water quality protection in the watershed.

Inventory work was also performed at the other end of the state for the Madison Cave Isopod, *Antrolana lira*, listed as threatened under the endangered species act. This species is a ground water obligate crustacean that dwells exclusively within the karst aquifer(s) of the Great Valley of Virginia and West Virginia.

Other activities of the DCR Karst program staff included:

- Assisting the United States Geological Survey in the identification of springs for groundwater age-dating
- Cooperating with the Virginia DEQ to resolve data development issues associated with impaired streams in Virginia's karst lands.
- Delineating the source of Beaver Creek, most of which appears to be pirated from adjacent watershed via a subsurface karst conduit.
- Performing hydrological studies to assist VDOT and a Scott County citizen resolve a dispute over stormwater flooding on the citizen's property.
- Cooperating with the Virginia Cave Board's Sinkhole Protection Committee to assure that state regulations, guidelines, and practices properly address karst water quality concerns. The current focus of these efforts is on runoff from highway corridors and adjacent developments into sinkholes, swallow holes, and cave entrances.
- Working on a karst features inventory and hydrology study of the Marion (Smyth County) area along the I-81 corridor relating to impacts from storm water disposal.

Additionally the staff is approximately halfway toward completion of the *Virginia Karst Hydrology Atlas*, which will be a Web-GIS based resource containing results from the vast majority of dye traces performed in Virginia. Such an atlas will be an invaluable tool for environmental review and other land use planning tasks.

The first half of fiscal year 2004 was extremely busy in terms of education and outreach. Project Underground teacher workshops and a facilitator (workshop leader) training were held. The karst education coordinator performed the following activities:

- Directed a workshop at an environmental education facilitator reunion that produced an additional eight new Project Underground facilitators.
- Developed new Project Underground activities to address the issue of watershed delineation in karst areas, in a manner consistent with the State of Virginia Standards of Learning (SOLs).
- Attended the regional meeting of the National Association of Science Teachers on December 2-3, 2004, in Richmond, Virginia. The coordinator presented a talk on karst education and Project Underground.
- Cooperated with the Skyline Soil and Water Conservation staff to organize a ground water festival for Floyd County sixth graders.

In celebration of Virginia Cave Week 2004, Virginia Cave Board member David Culver, of the Karst Waters Institute, created a poster on subterranean biodiversity. Karst program staff adapted the poster and will distribute it at karst education workshops and other outreach events.

For more information on DCR's Karst Program contact Wil Orndorff at 540-831-4056; for more information on Project Underground education activities contact Carol Zokaites at 540-831-4057 or visit the DCR web page at www.dcr.virginia.gov